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cmorrisette@smmalaw.com

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte RICHARD P. MODELSKI
and MICHAEL J. CRAREN

Appeal 2010-001912
Application 09/741,857
Technology Center 2400

Before JOSEPH F. RUGGIERO, BRADLEY W. BAUMEISTER, and
ANDREW CALDWELL, *Administrative Patent Judges*.

CALDWELL, *Administrative Patent Judge*.

DECISION ON APPEAL

SUMMARY

Appellants appeal under 35 U.S.C. §§ 6(b) and 134 from the Examiner's rejection of claims 1-3 and 5-18.

Claims 1, 3, 5, and 17 stand rejected under 35 U.S.C. § 103(a) as obvious over Hooper (US 2006/0156303 A1) in view of Davis (US 7,093,109 B1) and Mang (US 7,111,156 B1).

Claim 2 stands rejected under 35 U.S.C. § 103(a) as obvious over Hooper in view of Davis, Mang, and Epps (US 6,813,243 B1).

Claims 6-16 and 18 stand rejected under 35 U.S.C. § 103(a) as obvious over Hooper in view of Davis, Mang, Epps, and Fleck (US 6,292,845 B1).

Claims 1-3 and 5-18 stand(s) rejected under 35 U.S.C. § 112 2nd paragraph as being indefinite.

We affirm.

STATEMENT OF CASE

Appellants describe the present invention as a multi-thread packet processor that processes data packets using a multi-threaded pipelined machine. No instruction in the pipeline depends on a preceding instruction since each instruction in the pipeline is executed for a different thread. Abstract. Independent claim 1 is representative and reproduced below with key disputed limitations highlighted:

1. A method for routing a data packet comprising:

producing a plurality of threads associated with the packet, *each thread being a sequence of instructions* that facilitates packet routing and *that is independently executable with respect to other ones of the threads*;

assigning a thread identifier (TID) to each of the threads and maintaining an activity status for each thread;

for each thread, selecting a pipeline from a plurality of pipelines, *at least some of which are specialized*, and forwarding that thread to the selected pipeline, such that processing of each packet is divided into multiple independent threads which are processed by multiple pipelines, and *such that delay in processing of a first packet routing thread in a first pipeline does not affect processing of a second packet routing thread in a second pipeline*.

THE OBVIOUSNESS REJECTION – CLAIMS 1, 3, 5, AND 17

Appellants do not present separate arguments for independent claims 1 and 5. Appellants also do not present separate arguments for dependent claims 3 and 17. Rep. Br. 7-12. We therefore choose method claim 1 as representative of the group. *See* 37 C.F.R. § 41.37(c)(1)(vii).

ARGUMENTS¹

Regarding claim 1, the Examiner finds that the combination of Hooper in view of Davis and Mang teaches the method of claim 1. Ans. 4-6 and 14-18.

Appellants argue that the Examiner failed to establish a *prima facie* case of obviousness. Appellants allege the following errors:

¹ Rather than repeat the Examiner's positions and Appellants' arguments in their entirety, we refer to the following documents for their respective details: the Examiner's Answer (Ans.) mailed June 10, 2009; and the Reply Brief (Reply Br.) filed July 30, 2009. Since the Reply Brief repeats all of Appellants' arguments presented in the Appeal Brief and also includes additional arguments, all citations to arguments in this Decision will refer to the Reply Brief.

- (1) Hooper fails to teach that the delay in processing of a first packet routing thread in a first pipeline does not affect processing of a second packet routing thread in a second pipeline. Reply. Br. 8-9.
- (2) Davis does not teach producing a plurality of threads associated with the packet where each thread is a sequence of instructions that facilitates packet routing and that is *independently executable*. Reply Br. 9-10.
- (3) Mang does not teach a specialized pipeline. Reply Br. 10-12.

ANALYSIS

We are unconvinced that the Examiner erred in finding that Hooper teaches a method in which the delay in processing of a first packet routing thread in a first pipeline does not affect processing of a second packet routing thread in a second pipeline. Appellants argue that while Hooper may teach that threads are independent, the Examiner incorrectly concludes from this teaching that the delay of one thread does not affect another thread. Reply Br. 8. In support, Appellants point to the Background section of the present Application, which generally describes multi-thread processing. *Id.* The Background explains that a thread is a set of independently executable sequence of instructions. Spec. 2, ll. 5-10. The Specification then describes how a processor, when recognizing that an instruction has caused it to be idle, switches from the instruction causing the idle to another instruction (i.e., separate thread) independent from the former instruction. *Id.* Appellants argue that the “separate” thread, despite being independent, is delayed while the processor switches to it from the idle thread. Reply Br. 9.

We agree with Appellants that thread independence as described in the context of the Background section of their Specification does not

necessarily imply independence with respect to delay. As described in Appellants' Specification, a delay in one thread will affect another thread when there is *only one processing unit*. However, the rejection is based on Hooper and not on the general discussion of multi-threading from the Specification.

Hooper describes a system with multiple microengines. Hooper ¶ 0023. Appellants have not demonstrated that when two threads execute on different microengines, an idle for a thread executing on one microengine would delay a different thread executing on a different microengine. While Appellants' argument may be persuasive with respect to a system having a single processing unit that sequentially executes multiple threads, it is not persuasive regarding a system, like Hooper's, that includes multiple microengines processing threads in parallel.

We are unconvinced that the Examiner erred in finding that Davis teaches the limitation of producing a plurality of threads associated with the packet where each thread is a sequence of instructions that is independently executable with respect to other ones of the threads. Appellants argue that the portions of Davis relied upon in the rejection merely describe threads as independent and "are not described as being independently executable in terms of delay interdependence." Reply Br. 9. If Appellants are arguing that Davis does not teach threads that are *independently executable in terms of delay independence*, their argument is unpersuasive since it is directed to an unclaimed feature. Claim 1 merely requires a thread to be *independently executable with respect to other ones of the threads*. If Appellants are alternatively arguing that Davis does not teach that a thread is *independently executable*, the argument would be inconsistent with their own Specification.

As discussed in the Background section of the Specification, a thread is a set of *independently executable* sequence of instructions. Spec. 2, ll. 5-10. In view of Appellants' own explanation of multi-threading, the mere fact that Davis describes a thread means that Davis also implicitly teaches threads that are independently executable with respect to one another.² Since Appellants' argument is not consistent with their Specification, we do not find it persuasive.

We are unconvinced that the Examiner erred in finding that Mang teaches a method in which at least some pipelines are specialized. We note that Appellants do not argue that neither Hooper nor Davis teaches specialized pipelines.³ Instead, Appellants argue that the portions of Mang cited by the Examiner at best describe a pipeline (i.e., the computation engine of Mang Fig. 1, elem. 12) but do not describe a specialized pipeline. Reply Br. 10-12. Appellants' argument is unpersuasive because it ignores the fact that the computation element of Figure 1 is part of a computation module that may be used in a geometric engine of a video graphics circuit. Mang col. 2, ll. 53-55. A computation engine that processes geometric primitives is specialized.

For the foregoing reasons, Appellants have not persuaded us of error in the Examiner's obviousness rejection of representative claim 1.

² Hooper also teaches threads. Based on the same reasoning, Hooper also teaches threads that are independently executable.

³ But *see* Hooper ¶¶ 0032-0033 describing how the functionality of the microengine threads is determined by microcode loaded for a particular user's application into each microengine control store. Once programmed for a particular user's application, the microengine is *specialized*.

Accordingly, we will sustain the Examiner's rejection of that claim and claims 3, 5, and 17 which fall with claim 1.

THE OBVIOUSNESS REJECTION – CLAIM 2

With respect to the rejection of claim 2, Appellants provide no patentability arguments directed to the additional reference to Epps . Accordingly, for the reasons discussed above with respect to claim 1, we also sustain the rejection of claim 2.

THE OBVIOUSNESS REJECTION – CLAIMS 6-16 AND 18

With respect to the rejection of claims 6-16 and 18, Appellants provide no patentability arguments directed to the additional references of Epps and Fleck. Accordingly, for the reasons discussed above with respect to claim 1, we also sustain the rejection of claims 6-16 and 18.

THE REJECTION UNDER 35 U.S.C. § 112, 2ND PARAGRAPH

The Examiner contends that claims 1-3 and 5-18 are indefinite because they include the term “specialized,” which is a relative term that is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. Ans. 3, 17. Appellants argue, among other things, that “specialized” is not a relative term that presents a question of degree. Reply Br. 12-15. The Examiner's position appears to be based on a concern that the claims are indefinite because they are unduly broad. This position is untenable though, as the law on this point is well settled: the breadth of a claim is not to be equated with

indefiniteness. *See e.g., In re Miller*, 441 F.2d 689, 693 (CCPA 1971). Appellants have therefore persuaded us of error in the Examiner's indefiniteness rejection of claims 1-3 and 5-18.

CONCLUSION

The rejection of claims 1, 3, 5, and 17 under 35 U.S.C. § 103(a) as obvious over Hooper in view of Davis and Mang is sustained.

The rejection of claim 2 under 35 U.S.C. § 103(a) as obvious over Hooper in view of Davis, Mang, and Epps is sustained.

The rejection of claims 6-16 and 18 under 35 U.S.C. § 103(a) as obvious over Hooper in view of Davis, Mang, Epps, and Fleck is sustained.

The rejection of claims 1-3 and 5-18 under 35 U.S.C. § 112, 2nd paragraph, is reversed.

DECISION

The Examiner's decision rejecting claims 1-3 and 5-18 is affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1). *See* 37 C.F.R. § 1.136(a)(1)(iv) (2010).

AFFIRMED

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